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City Vigilance League (New York, N.Y.)

[Memorandum on state water commission...

[New York]

[1906]

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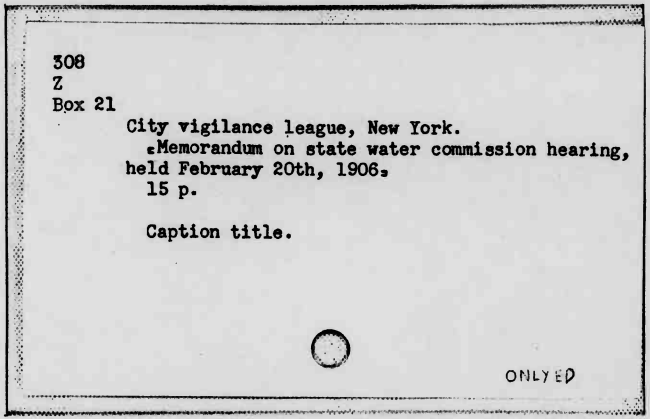

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[Memorandum on state water commission hearing, held February 20th,, 1906]

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CITY VIGILANCE LEAGUE

105 East 22d Street, New York

Room No. 612

March 9th, 1906.

To the State Water Commission:

We desire to supplement our communications with the following statement:

1.—As to leakage in the City;

We have reinvestigated the great leakage from the City Reservoir, and find that the leaks we exposed publicly in 1899 are still running through the culverts which were built to protect private buildings that have been invaded by the flow of Croton Water. These leaks have existed for many years. We find, also, evidence of great leakage from the reservoirs in the Brooklyn System.

2.—As to the underground supply of water on Long Island available for Brooklyn and Queens;

We find that there are in existence careful workings on the geological surveys showing plainly the existence of the great strata of underground water throughout Long Island,—wherein is stored naturally the rainfall of the island. Professor Burr has expressed himself strongly concerning the usefulness of this supply;—which is immense, excellent, and easily and cheaply obtainable, and which runs naturally towards Brooklyn.

3.—As to the laws excluding the City from Dutchess County;

Had the City authorities been willing to enter into such arrangements with Dutchess County as are now being made with Ulster County, the law would not have been passed. If New York would do as much now for Dutchess County as is being proposed for Ulster County, the Dutchess County exclusion act could be repealed without difficulty. It would be easy to provide for the protection of the mills at Wappinger's Falls, and yet give the City the benefit of all the flood waters, and a generous proportion of the regular flow.

4.—Suffolk County could be provided for fairly, too.

5.—The interests of New York State lie in saving the Catskill water for the benefit and for the natural beautifying of the

INTENTIONAL SECOND EXPOSURE

CITY VIGILANCE LEAGUE

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5.—The interests of New York State lie in saving the Catskill water for the benefit and for the natural beautifying of the

Catskill Mountain region, New York's great and popular health and pleasure resort—and in directing New York City to conserve the Croton water and to so direct her policy that the inevitable extensions to be made for additional water shall be on the eastern side of the Hudson River, until the ample Adirondack watershed is reached, from which water may be drawn for the benefit of this entire section of New York State.

FRANK MOSS,
Chairman Executive Committee,
299 Broadway,
New York City.

President:
MATTHEW BEATTIE
241 West 54th Street

Treasurer:
WILLIAM P. YOUNG
218 West 121st Street

The
City Vigilance League
of New York
105 East Twenty-second Street
Room 612

Incorporated April, 1895
Honorary President: CHARLES H. PARKHURST

"Whatever concerns the welfare of the city is made the subject of inquiry and conference."

Vice President:
FRANK MOSS
299 Broadway

Secretary:
THOS. L. McCLINTOCK
Room 612
105 East 22d Street

New York, March 27, 1906

Whatever view you may hold on the Catskill Water Scheme, we ought to be of one accord in trying to secure the passage of the bills repealing the laws that forbid New York City to take water from Dutchess and Suffolk Counties.

These bills were introduced by Senator Saxe and Assemblyman Eckmann, (as to Dutchess County) and Senator Cooper and Assemblyman Harvey (as to Suffolk County). Letters to them, or to us, to be sent to them, would be useful.

Thomas L. McClintock,
Secretary,
105 East 22d St. New York City.

President:
MATTHEW BEATTIE
241 West 54th Street

Treasurer:
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Secretary:
THOS. L. McCLINTOCK
Room 612
105 East 22d Street

New York, March 27, 1906.

Dear Sir:

Herewith you will find a copy of the brief of the City Vigilance League in opposition to the $200,000,000 Catskill Water Scheme.

Protests may be sent directly to the State Water Commission, South Pearl Street, Albany, N. Y.

If you favor our position, please write to

Yours truly,
THOMAS L. McCLINTOCK,
Secretary.

Case 2 1915 M5

CITY VIGILANCE LEAGUE

105 East 22d Street, New York

Room No. 612

Memorandum on State Water Commission Hearing,

Held February 20th, 1906

Additional to Brief Submitted

On our claim that half the Croton Water Supply is wasted at the Dam

There was no pretense of objection to the official figures of the City Water Department produced by us, showing that from 1891 to 1903, there was a yearly average waste of 81 billion gallons, and a yearly average delivery to the City of 77 billions. "Waste" was the language of the official reports.

BUT, it was disingenuously suggested that the new Cornell Dam will take care of this waste from the Croton Dam.

If that be so, then it is plain that our present supply will be doubled, and the Catskill plan will be unnecessary.

But we showed that when the Cornell Dam, with its **extreme** capacity of 30 billion gallons is filled up, the overflow will continue out of that reservoir, and will, of necessity continue, even with additional dams, until the whole Croton outgo of 158 billion gallons, yearly average, is so impounded and so controlled as to be ALL delivered to the City, and is ALL used there. It stands to reason that if dams, aqueducts and pipe lines be so constructed as to give the City this entire water yield, the day of water famine will be deferred long enough for us to do those things necessary to secure the addition to the Croton System, of other near sources of supply.

Denials were made by two employees of the City, which is committed by official action to the project.

Mr. De Varona, estimating waste at 15 per cent., did not claim to know much about Manhattan, and Mr. Birdsall, estimating 10 per cent., gave no basis for his estimate. Mr. Birdsall was saying the same thing during the Mazet Inquiry, while General Collis and Mr. Croes were stating their knowledge of great losses, which Mr. Croes stated to be half, and he testified in the face of similar expert opinions based on personal observations, given by Colonel Waring, Mr. Freeman, Mr. Hill, and others. The testimony of these two city engineers is ridiculous.

On the hearing, our claims of excessive leakage were reinforced by the opinions of Comptroller Coler, Lucien Knapp, and the celebrated hydraulic engineer, Clement Hirschel, who said without hesitation, that the waste in the city is fully one half, and who specified such American cities as Cleveland, Milwaukee and Providence, as having solved the problem of wasteage and having cut down greatly the apparent per capita consumption of water by using practical methods.

It appeared in the statement of Alderman Doull, in the Aldermanic hearing on meters, the following day, that in Liverpool at the present day, with the great additional supply brought from Wales, after the Deacon method of discovering and curtailing waste had been used with signal success, the per capita consumption now is 68 gallons,—about one-half of New York's apparent consumption.

The testimony of Mr. Kelly, Water Register under Mayor Low, who had charge of the districts that were metered and opened during the experiments of Engineer Hill, also sustained the claims of heavy wasteage; and he showed that the stealing of water, permitted under lax administration, was a large item.

From the testimony given at this hearing, it was clear that there is an excessive leakage, which could be discovered and remedied by modern methods, and that house to house inspection would reveal much leakage in plumbing. It appeared that half the water has been going to waste in the watershed, and half the remainder has been going to waste in the city, and that most of this waste is preventable.

These facts, together with the probability of being able to get a cheaper and better supply from other sources nearer the Croton System, justify us in trying to call a halt on the Catskill plan.

At this hearing, facts were presented tending to show an excessive leakage from the Central Park Reservoir, and since the hearing we have received information that leads us to believe there is a great leakage in the Brooklyn works at Ridgewood (especially in basin 3), and at Millburn.

In view of these things, and with the recollection of the testimony in the Mazet Investigation, that showed close connection between certain water officials and certain meter-company interests, it might be well to stop the leaks even before a general compulsory meter system is imposed.

The Executive Committee:

Frank Moss, Chairman,
Thos. L. McClintock, Secretary,
Matthew Beattie,
William P. Young.

CITY VIGILANCE LEAGUE

105 East 22d Street, New York

Room No. 612

February 20th, 1906.

To the State Water Commission:

We regret that in the multitude of public matters that have occupied the attention of the people, the subject of WATER has not received the consideration that was due to it.

Many are deeply interested in the subject, and, like ourselves, find that under the peculiar provisions of the law the time for filing objections expired long ago, and we are not legally entitled to present objections.

Nevertheless, your commission is empowered to inquire into the subject—to hear evidence and opinion, and has practically all the power of a legislative committee.

This permits the calling of engineers other than those of the City Water Supply Board, who are committed to the Catskill plan.

Certain authorities of the city are earnestly endeavoring to secure your approval of this Catskill plan,—which involves the taking of a large quantity of water from a distant region west of the Hudson River, against the protest of residents thereof,—at a cost to the City of New York of an amount estimated from one hundred and sixty-one to two hundred and fifty million dollars, under circumstances involving great delay,—and in such a way that the water interests of the State are not conserved at all.

Inhabitants of the Catskill district have presented their objections at several sessions held in the distant city of Kingston, and now—in one final session held in the City of New York, with very inadequate advertising and notice, the New York City objectors are expected to formulate their protest.

From the standpoint of the interests of New York City, after conference with many individuals of experience and knowledge, we object and protest,—and we assign these reasons for our position:

1.—Your board is required by the Act to consider the interests of the whole State, and is expected to formulate a State plan. You have not had time to go deeply into so vast a subject. New York City, by reason of its immense consumption of water, and its great financial resources, should be included in any plan that considers State interests East of the Hudson River, and adjacent to it; and the committing of New York to this Catskill plan effectually shuts the City out of any large and comprehensive plan including the general interests of this part of the State.

The present needs of New York City in any view can be provided for, while the commission takes a reasonable time to so examine the water resources and the water needs of this section of the State.

2.—New York City does not need to go so far away from its long established base of supply, nor to invade another and separated section of the State, which resents the proposed invasion. The proposition involves a fabulous expenditure of money, and a great loss of time.

We are far from utilizing our present resources, and far from reasonably conserving the water that is delivered to us from those resources.

A.—For many years fully one half of the present supply of Croton Water has gone to waste at the dam.

B.—A tremendous leakage in the City loses about one half of the water that is delivered, and a greater pressure will develop greater leakage. The use of approved methods of detection and repair and repression of waste would not only give us a great increase in our store of water, but also would put the system in the condition necessary to receive more water and greater pressure. Excessive waste in the City is a matter of grave concern for your Commission, for if it continue, it leads to the invasion of other parts of the State by the city,—the destruction of farms, hamlets and villages,—and the excessive use of the water resources of the State, which may be needed hereafter for other cities.

C.—Brooklyn can be supplied independently of the Croton System, by tapping natural sources, and by pumping.

A.

WASTE AT CROTON DAM.

The last annual report of the Water Department, available, is that of 1903. A careful examination of the reports of the Department for the years 1891 to 1903, inclusive, show as yearly averages, that 77 billion gallons were brought to the City, while 81 billions ran over Croton Dam to waste.

The figures for 1903, show that 97 billion gallons were delivered to the City and nearly 102 billion went to waste over the dam.

The new "Cornell" Dam, just completed, will hold about 30 billions (bringing our storage capacity up to about 70 billions),—and we will soon have the benefit of that additional supply—a supply equal to that of London with 12 million population.

There is room for other reservoirs to impound the balance of the waste.

Reservoirs can be built more quickly in the Croton watershed than in the Catskills, because the engineering problems have been worked out,—and conduits would be shorter and more easily and quickly built.

It is far from impossible that additional supplies may be obtained and delivered into the Croton system, from the Ten Mile River, and from smaller streams.

This work would not involve the new engineering problems, and the necessary delays incident to going across the Hudson River and into the distant Catskill county.

The average rainfall in the Croton watershed for 33 years is given as over 48 inches; for the 12 years from 1891 to 1902 it seems to have averaged 50 inches, as shown in Mr. Freeman's report. According to the departmental reports, MORE THAN HALF the water which reached Croton Lake went "over the old Croton Dam to waste."

	Brought to City and said to be used.		Run over Croton Dam to waste.	
1891.....	53,375	million gals.	100,754	million gals.
1892.....	56,545	" "	45,825	" "
1893.....	59,868	" "	119,732	" "
1894.....	61,939	" "	73,375	" "
1895.....	64,088	" "	49,129	" "
1896.....	74,951	" "	56,346	" "
1897.....	76,836	" "	66,601	" "
1898.....	82,827	" "	109,476	" "
1899.....	92,509	" "	78,220	" "
1900.....	92,482	" "	47,254	" "
1901.....	93,938	" "	95,611	" "
1902.....	99,280	" "	109,500	" "
1903.....	97,090	" "	101,952	" "
13 yrs.	1,005,728	avg. 77 bill.	1,953,775	avg. 81 bill.

The totals for 1904-5 have not yet been published, but as the engineers speak of them as "wet years," it is safe to say they are not under above average.

B.

WASTE IN NEW YORK CITY.

In the Mazet Investigation this subject was inquired into carefully; and we will state the substance of some of the testimony:

HUGH BONNER, a former Fire Chief,—testified to an immense loss of water from leaky hydrants and mains and from carelessness of City employees in the use of the hydrants. He said that the hydrants are antiquated and prone to leak, and that they are inserted into the mains so rudely, and are so without support that the necessary shaking of the hydrants by the operation of fire engines, loosens the connections and establishes underground leaks. He said that a large proportion of the hydrants are thus leaking.

ALONZO S. GEAR, an employee of the Water Department, and an expert on hydrants, confirmed Mr. Bonner's statements, and added the item of house-cocks, which he said are not screwed into the mains by the use of a "saddle" as in other cities, but are driven with sledges

into holes bored into the mains, and that great numbers of these house connections are leaking. He spoke, also, of many defective water gates which leak continuously. He said that it is conceded generally that more water is waster than is used.

GENERAL COLLIS, Commissioner of Public Works, and an engineer of ability, testified: "The pipes down town have been laid for sixty years. They are worn thin by friction. I have seen them myself. They were laid there for supplying one, when they now supply a hundred, and they are subject to an additional pressure which they are not equal to. There are leaks—it has been so reported to me—over the whole down town region where these old pipes are, and that is constantly percolating into the ground. Then he spoke of preventable waste in houses. He said that there was a great leakage from defective plumbing,—and that if the pressure were doubled, South of Canal Street, the plumbing generally would break out."

COLONEL WARING'S written opinion was quoted as follows: "The distributive system of every large water supply in America is like a sieve. Water is poured in at the source, and dribbles away at a thousand points. Every leak like every open faucet weakens the head until where water flowing through tight pipes would reach top floors, it now runs with little force at the ground level. Water works are not constructed for the sub-irrigation of the site of a town, but that is their general and increasing function. Whatever else may happen the underground leak may be depended upon 24 hours in the day and 365 days in the year. It may be depended on to increase as time goes on and as the demand for water grows. Underground leaks rarely close up with use. They grow larger rather than smaller and if more head is put on at the beginning of the pipeage to get more head at remote points, every leak will be made to run the faster in consequence."

JAMES W. PRYOR, Secretary of the City Club, and other witnesses testified of great leaks that had been discovered unexpectedly. Such were discovered in excavating at the New York Athletic Club, the Corn Exchange Bank, the Evening Post Building, the Mail and Express Building. A six inch main was found flowing into the sewer. A large leak was found flowing down 89th Street from the Central Park Reservoir, against which builders have to build protecting structures to deflect the water into sewers. We believe that this leak is still running. Many great leaks have been discovered since those days. We are informed that at a number of buildings down town, wells have been sunk from which Croton water is drawn out of the ground, to be used for general purposes.

J. JAMES R. CROES, an engineer of forty years' practice was connected with the Comptroller's office, investigated the Ramapo scheme, and was specially qualified to testify on this subject, having been engaged in the building of water works in Brooklyn, in New York and in Washington, on aqueducts in the Croton system, and on similar works in a large number of cities. He was connected with the New York Water supply for ten years, and with various watersheds in New Jersey. He said it was doubtful whether water at the

pressure offered by the Ramapo company could be delivered in the pipes south of 42d Street because of the bad condition of the pipes which would leak even more than ordinarily. He said their great leakage was a matter beyond doubt, and of general existence downtown, and while a general condition in cities, was specially liable to be the case in New York, because of the great age of much of the distribution system. He spoke of the quantities of water flowing through the new mains on Fifth Avenue as being out of proportion to the consumers thereon, and he declared that the forcing of water at greater pressure through the present system would increase the leakage. He said it would be possible to locate and remedy the leaks, and to replace worn out pipes. He said "Whether it is possible to put the greater pressure on the pipes in the lower part of the city below 42d Steet is very doubtful. The quantity of water drawn through the pipes at the present time is so great and out of proportion to the number of consumers and is moreover increasing so rapidly and out of proportion to the increase in population that it cannot be attributed to any other cause than defect in the distribution system. Any system of pipe distribution is subject to deterioration. The rate of this deterioration per annum is very light during the first 20 or 30 years of the life of the pipes, but after that period increases in a rapidly increasing ratio. Cracks will occur in pipes, pipes will become corroded until small orifices occur through which water escapes, and joints will leak from settlement or other causes, producing a large dischage of water into the ground, but not sufficient to show at the surface unless a break actually occurs. This underground leakage, which is not visable at the surface, takes a large amount of water out of the pipes and causes an apparent increase in consumption, which is really nothing but an increase of waste due to the natural progress of the deterioration of the pipes. This view of the matter is in accordance with the experience of all large cities and in this instance is sustained by the consideration of the facts as they exist in New York and Brooklyn now. The increase of population of the City is at a rate of 2-7/10 per cent. per annum. The increase of consumption of water is at the rate of 7-5/10 per cent. per annum, or 4-8/10 per cent. greater than the increase of population. The water-works of Brooklyn are 40 years old. The rate of increase of population is 3-6/10 per cent. per annum, and at the rate of increase of consumption of water is 6-1/10 per cent. per annum, a difference of 2-5/10 per cent. per annum. This indicates that the rate of increase of consumption increases with the life of the pipe system. The actual consumption of water in New York City at this time is nearly double what is required for all legtimate purposes, and reasoning from analogy and from the expeience of other cities, this excess of consumption is due mainly to the deteriorated condition of the older portions of the distribution system. To increase the head of water on this deteriorated and leaky distribution service would increase the waste and hasten the deterioration. The remedy for this condition of affairs is to be in the systematic inspection and repairing of the distribution system, particularly in the lower part of the city, and there is no reason to doubt that such an inspection systematically and scientifically undertaken would result in a very great diminution of the waste and consequently as an apparent increase in the amount of water supplied to the city. In mak-

ing provisions for an increased supply, the first step therefore is to stop the flow of water into the ground from the pipes, which would have a more certain and durable effect than the impounding of additional water above the Croton dam."

It appeared that the heads of the Water Department for years have reported the excessive waste of water in buildings; and it appeared that a general use of meters would cause a general reduction of meter charges, so that meter rates would not be burdensome as they are now.

James W. Pryor's testimony brought out a very important investigation of water waste which had been made for the City Club by experts of eminence, including James R. Bayles, Colonel Waring, General Ludlow, George F. Deacon (who invented and used his celebrated system for the detection of water waste in the City of Liverpool), and Lord Kelvin.

The consensus of opinion of these gentlemen was stated to be that "the loss of water in the City of New York, due to leakage and preventable waste, is perhaps more than half of the total quantity of water flowing through the mains," and "the process of determining the amount of this loss, the exact location of leaks and the buildings in which water is wasted is a certain and scientific process which has been applied successfully in many cities;" and "An average of 38 or 40 gallons a day for each person represents an abundant supply for all purposes, including the inevitable waste not due to leaks;" and "There was no possible doubt that there were many serious leaks in the underground system and mains that could certainly be detected by the application of a simple and inexpensive method."

In the report of that commission it was stated:

"In 1873 the supply of water in Liverpool was so insufficient that it was sometimes necessary to limit the flow to a very few hours each day, and at no time was the flow maintained for more than twelve or fourteen hours of the twenty-four. Under these conditions the apparent consumption was about 27-1/2 gallons a day for each person in the city. By way of experiment, a constant supply was given for a time, with the result that the apparent consumption amounted to 40 gallons a day. In this emergency Mr. Deacon, who was then chief engineer of the Liverpool water works, addressed himself to the problem of discovering and preventing the waste of water. The result was the invention of the differentiating meter system, commonly called the Deacon meter system. This system, in its full development, will detect with accuracy very small leaks and sources of waste. It was gradually extended, district by district, over the city of Liverpool, until at the end of 1875 the whole city was covered, and the work was so far completed that a constant supply of water had been restored, with less expenditure of water than formerly, notwithstanding a large increase of supply for trade purposes. From time to time, for two or three years, the apparent rate of supply continued to decrease and the pressure to increase, although the amount of water actually used by the people had been greatly increased.

In 1877 Mr. Deacon projected the great scheme for drawing Liverpool's water supply from the river Vyrnwy in North Wales. This work, involving the largest atificial lake and the lagest aqueduct in Europe, was begun in 1880 and completed in 1890, at a cost of

23,000,000 pounds sterling. In the meantime, the proceeds of the water saved and sold by the city had reached an annual amount which was equal to the interest upon 1,500,000 pounds, at the rate of which Liverpool could borrow money. In other words, the water saved paid practically about two-thirds of the cost of the new water works.

With the present constant and abundant supply, Liverpool uses about 27-1/2 gallons for each person."

"There is probably no modern city in which the legitimate demands for water and the facilities for using it are greater than in Liverpool. Water-closets are generally used, and baths are provided in all houses of more than 18 pounds rental value. Public baths and wash houses are provided to a larger extent than in any city in the country. Public drinking fountains are numerous, and water is freely used in flushing sewers and drains and in street sprinkling."

"The assumption that the condition of New York water mains is not better than was the condition of the Liverpool mains before they were subjected to inspection by the Deacon method is not a violent assumption. The great age of many of our water mains, the enormous number of excavations made near the mains, the presence in the soil under many streets of at least one pipe system which creates conditions favorable to leaks, the inherent probability that mains laid under the political conditions which prevailed before 1895, were poorly laid—all these combine to produce reasonable certainty that our system of water pipes, which has not been tested, is not in better condition than those of Liverpool and the other English cities in which the Deacon test has been applied. It is interesting to observe that the commissioner of public works reports that in 1896 the department repaired 8,350 fire hydrants, 1,492 stop cocks, and 1,047 leaks in water mains. Presumably these leaks have declared themselves by some external indications and did not belong to the large and equally industrious class of leaks which can be found only by systematic search. The present purpose is not, however, to convince citizens of the amount of New York's water waste; the purpose is to make it clear that the municipal authorities ought to avail themselves of well known methods of preventing leakage before they suggest the expenditure of millions for additional water works."

Mr. George F. Deacon, C. E., formerly chief engineer of the Liverpool water works, in his address as president of the Sanitary Institute of Great Britain in 1894, said:

"All town supplies of water are divided, as we now know, into two separate parts:

"1. That part which reaches the water fittings and is actually made use of or wasted by the consumer.

"2. That part which leaks out from the pipes, joints and fittings, and may do evil but cannot possibly benefit any one.

"Experience of a large number of water supplies in this country and abroad has satisfied me that, on the average, the second division —that is, water lost by leakage,—is the larger of the two."

In summarizing the results of his work in Liverpool, Mr. Deacon said:

"Of such a change in so short a time Liverpool might well be proud, but when it is known that after paying all the expenses of that

change, none of which were charged to capital, a great revenue has been derived from the sale of water formerly lost through the leakages of which I have spoken, there is cause not only for pride but jubilation."

Mr. William Hope, C. W., in a paper on the "Waste of Water in Public Supplies and its Prevention," read before the British Institution of Civil Engineers in 1891, says:

"The fact that a large portion of the whole quantity of water in most public supplies is wasted, without the knowledge of the water authorities or the consumers, is as incontrovertible as it appears to be difficult to conceive.

"Even now a majority of the water undertakings of this country lose by leakage one-half of the total quantity of water supplied from the source. The proportion is often higher, and rises in many cases to three-fourths or more while in comparatively new countries, such as America, Australia, and New Zealand, the proportion so lost is still greater. * * * Of large-sized underground leaks discharging through self-made channels into sewers and drains, previously unknown examples are now frequently discovered by the waste-water meter system. They have been detected of almost every size, even up to constantly flowing qualities sufficient for the supply of 2,000 to 3,000 houses."

Our own General Ludlow added similar testimony as to conditions in America.

What reason is there to believe that New York with its ancient pipes, its antique hydrants, and its crude method of tapping the mains, is an exception to the general rule of vast leakage, and why cannot the method so successfully used in Liverpool, be applied here before we go into a great Catskill Mountain job, that will burden the City with financial obligations, and impede the progress of municipal improvements imperatively needed?

THIS MASS OF EVIDENCE brought out in the Mazet inquiry does not stand alone.

Other engineers and city authorities have reported the same conditions.

COMMISSIONER DALTON, acting upon the reports of engineers in 1898, said:

"Making the most liberal allowance for increase, the conclusion is yet irresistable that enormous quantities are carelessly or wantonly wasted without any possible benefit in any direction. I believe it is safe to say that no other large municipality on the face of the globe uses and wastes its public and artifical water supply in such profusion, and that few, if any, of them have such quantities of supply at their disposal for use or waste."

The lesson to be drawn from this experience is the absolute necessity of effective measures to restrain waste,—because prolonged and unchecked indulgence in waste creates a fixed habit which cannot be overcome so long as the material for waste is at hand.

FOSTER CROWELL, an expert engineer, reported to the Merchant's Association these figures,—to account for the daily use of water in the City:

Domestic and trade uses	97,350,000
Public uses	9,735,000
Preventable waste	120,714,000

COLONEL B. S. CHURCH, for over 25 years in charge of the Croton Supply, says that one-half or two-thirds of the water brought to the city has been wasted.

The Society of the Municipal Engineers of the City of New York published a paper upon "The Investigation of New Sources of Water Supply for the City of New York," by A. S. Tuttle, an engineer in the employ of the Board of Estimate and Apportionment of the City of New York, in which he showed that the actual consumption in eight (8) metered houses in Brooklyn was 29 gallons per head per day, and said "to my mind the record fully establishes that 40 gallons per head per day includes a sufficiently liberal allowance for actual use," and while advocating a timely extension of the watershed, says, that—with the stoppage of the waste "there would be no occasion for—anxiety as to the adequacy of the present supply for many years to come."

JOHN R. FREEMAN once reported to Comptroller Coler, though at Kingston he expressed a somewhat modified opinion:

"The present waste of water amounts to surely one-half and probably two-thirds of the entire amount of water, delivered to the Borough of Manhattan."

"The relative proportion of use and waste for Manhattan and Brooklyn is brought out so clearly as to leave very little doubt that more than half and probably two-thirds of the total supply is wasted through leakage."

"By observation made under my supervision at the Central Park Reservoirs it is shown to be probable that out of 116 gallons per inhabitant per day ,now regularly delivered from the Croton Aqueduct, two-thirds is wasted. In Brooklyn similar measurements show that one-half is wasted."

The City Club, which caused the inquiry in 1897, above referred to, continued its investigation, and in 1902 published a report full of testimony as to conditions of waste. The opening words were:

"Since 1880, the water poured into the distributive system of Manhattan and the Bronx has increased at the rate of more than two and a half times the rate of increase in the population, and yet it will be scarcely a year before we shall be confronted with a shortage of water for the city's daily needs.

"This means that the City government has failed in one of its most important and fundamental administrative functions; indeed, it is scarcely too much to say that, if there be no change in our administrative service, the City's supply of water might be immediately doubled, at enormous expense, and we should again be as badly off as ever by the end of another decade. Pouring water into leaky pipes, while taking almost no steps to prevent careless or wanton waste, or to remedy defective street connections or bad plumbing in the interior of houses and buildings, and

largely failing to collect revenues for water actually used, may be said to sum up the administrative service of the City, so far as the water is concerned."

The general conclusions as to waste were sustained by the addresses of seventeen expert engineers reported in the transaction of the American Society of Civil Engineers, No. 908, vol. 46, under the title of "The Consumption of Water in Municipal Supplies and the Restriction of Waste," July 27th, 1901.

BROOKLYN SUPPLY.

LUCIEN KNAPP, former Treasurer of Long Island City and Commissioner of Public Works for Queens, will present facts to show that Brooklyn and Queens may be supplied easily and cheaply for an indefinite period from a great underground body of water on Long Island.

The report of the City Board of Water Supply on this subject indicates their belief in the probable correctness of this position.

NOTE: We find that the existence of this great and excellent supply of water is established by abundant testimony,—that Professor Burr, consulting engineer of the City Water Board, has expressed himself warmly on the subject,—and that plans are in existence, based upon the natural flow of this water towards Brooklyn, by which it can be pumped —all with comparatively small expenditure of time and money.

ADDITIONAL MEMORANDA.

The report of Engineer John R. Freeman to Comptroller Coler in 1900 should not be forgotten.

After stating the details of careful experimenting for ten days at the Central Park Reservoir, he said: "We are, I believe, forced to conclude that water was running to waste at night at the rate of 68 gallons per inhabitant per 24 hours," and he said we could fairly expect incurable waste not to exceed 5 to 10 gallons per inhabitant. At that time the measured delivery of the aqueduct was 116 gallons per inhabitant and metered flow for manufacturing and commercial purposes was 24 gallons, so real domestic use was figured at only 12 gallons, which was about the same as Fall River with a nearly perfect water system.

Mr. Freeman stated that the total consumption in New York under as good a management as that in Fall River would be about 55 gallons.

(We are now (1906) running at about 124 gallons per inhabitant.)

Mr. Freeman gave as the most important elements in this City waste, these: leaky houseplumbing; old leaky abandoned service pipes between street mains and cellars; house-taps left open; leaky joints in Manhattan's 833 miles of pipe, and rust holes and cracks in old pipes; possibly some small loss by theft of water.

He considered sources of new supply near to, and that could be connected with the Croton system, such as:

NEW SOURCES.

The Ten Mile River and East Branch would easily deliver 200 million gallons a day, at 305 feet elevation, at the City limit at a cost of

$25,000,000,—and the only apparent difficulty in the way would be the necessity of an arrangement with Connecticut on a financial basis, for diverting part of the water that now runs into Connecticut.

By combining the upper Housatonic waters with the Ten Mile a supply of 750 million gallons a day could be secured at an outlay of forty-seven million dollars ($47,000,000), besides such payment to Connecticut as might be necessary.

The watersheds north of the Croton District would supply 150 million a day.

He considered also the plan to take water from the Hudson River above Poughkeepsie, and also the plan to bring water from the Adirondacks, which last project he dismissed from consideration because of the excessive cost, which would be $60,000,000 for 200 million gallons a day or $90,000,000 for 400 million gallons a day.

If Mr. Freeman be right the Adirondack plan would be much cheaper than the Catskill plan, even allowing for the increased cost of work and materials, and as it could be made to deliver as much as one billion gallons a day, the wants of all the cities along the East side of the Hudson River could be considered and provided against for a great period of time.

OUR CONCLUSION IS:

that the interests of the State as well as of the City require that this application should be denied,—and that the City of New York should be advised to develop and use the full resources of the Croton watershed, spreading as it can to the adjoining water supplies that can be delivered through its present system, and adopting and using up-to-date methods for stopping the City waste that has been described.

Meanwhile the Commission may enter upon that study of the entire water problem which was intended when the law of 1905 was enacted.

Respectfully submitted for the City Vigilance League by its Executive Committee,—

FRANK MOSS, Chairman,
THOMAS L. McCLINTOCK, Secretary.
MATTHEW BEATTIE,
WILLIAM P. YOUNG,
THOMAS A. FULTON.

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